

## CLAIMS

1. A method for manufacturing a planar sensor, comprising:  
disposing a film of a material on a substrate, wherein the material is selected from the group consisting of platinum, rhodium, palladium, iridium, gold, and mixtures and alloys comprising at least one of the foregoing materials;  
annealing the material;  
measuring a resistance value of the material;  
laser trimming the annealed material;  
heat treating the laser trimmed material; and  
laser trimming the heat treated material to form the sensor.
2. The method of Claim 1, wherein the film has a nominal thickness of greater than or equal to about 2 micrometers.
3. The method of Claim 1, wherein laser trimming the annealed material further comprises setting a laser trimming device to a first setting to achieve a first inputted resistance value and laser trimming the heat treated material further comprises setting a laser trimming device to a second setting to achieve a second inputted resistance value.
4. The method of Claim 3, further comprising laser trimming an amount of the annealed material sufficient to meet the first inputted resistance value, and laser trimming an amount of the heat treated material sufficient to meet the second inputted resistance value.
5. The method of Claim 1, wherein the heat treating is maintained until an inflection in a resistance versus time curve is reached.
6. The method of Claim 1, wherein the heat treating is at a temperature of about 1,000°C to about 1,600°C.

7. The method of Claim 1, further comprising:  
determining a value for a resistance overshoot as a function of a thermal coefficient of resistance of the material; and  
wherein the annealed material is laser trimmed by an amount determined in relation to the resistance overshoot value.
8. The method of Claim 1, wherein laser trimming the annealed material further comprises cutting a pattern having an elongated configuration into the material.
9. The method of Claim 8, wherein the elongated configuration is chosen from a serpentine pattern and a spiral pattern.
10. The method of Claim 1, further comprising laser trimming greater than 25 mm of the annealed material.
11. The method of Claim 10, comprising laser trimming greater than or equal to about 50 mm of the annealed material.
12. The method of Claim 11, comprising laser trimming about 100 mm to about 250 mm of the annealed material.
13. The method of Claim 1, wherein the material comprises platinum.
14. The method of Claim 1, wherein the material is platinum.

15. A method for manufacturing a planar temperature sensor, the method comprising:

disposing a film of material having a material thermal coefficient of resistance of greater than or about 800 parts per million per degree Celsius, on a substrate;

measuring a resistance value of the material;

setting a laser trimming device to ablate material consistent with achieving the inputted resistance value; and

ablating greater than or equal to about 50 mm of the material to form the sensor.

16. A method for manufacturing a planar temperature sensor, the method comprising:

disposing a material having a thermal coefficient of resistance of greater than about 800 parts per million per degree Celsius, on a substrate;

measuring a resistance value of the material;

setting a laser trimming device to ablate material consistent with achieving the inputted resistance value; and

ablating greater than or equal to about 50 mm of the material.

17. A method for manufacturing a planar temperature sensor, the method comprising:

disposing a material having a thermal coefficient of resistance of greater than about 800 parts per million per degree Celsius, wherein the substrate has a single film thereon;

measuring a resistance value of the material;

setting a laser trimming device to ablate material consistent with achieving the inputted resistance value; and

ablating the material to form the sensor.

18. A method of making a planar temperature sensor, the method comprising:
- disposing a material on a substrate, wherein the material is selected from the group consisting of platinum, rhodium, palladium, gold, and mixtures and alloys comprising at least one of the foregoing materials;
  - annealing the material; and
  - vaporizing a portion of the material to form a sensing element on the substrate;
  - vaporizing a portion of the substrate; and
  - depositing the vaporized substrate material on the sensing element to form a protective coating.
19. The method of Claim 18, further comprising disposing an additional protective layer over the sensing element.
20. The method of Claim 18, wherein the substrate comprises about 86 wt.% alumina to about 99.5 wt.% alumina, based on a total weight of the substrate.
21. The method of Claim 18, wherein the substrate comprises greater than or equal to about 95 wt.% alumina, based on a total weight of the substrate.
22. The method of Claim 18, wherein the protective coating has a thickness sufficient to inhibit grain growth, pore coalescence, and pore nucleation in the sensing element.
23. The method of Claim 22, wherein the thickness is about 2 nm to about 2000 nm.

24. The method of Claim 18, wherein the protective coating comprises a material selected from the group consisting of aluminum, silicon, yttrium, zirconium, and mixtures comprising at least one of the foregoing materials.

25. The method of Claim 18, wherein the protective coating is an aluminide or a silicide.

26. The method of Claim 18, further comprising cutting a margin portion of the sensing element and a portion of the substrate, such that vaporized substrate material is re-deposited onto the sensing element to form a protective coating.

27. A method of making a planar temperature sensor, the method comprising:

disposing a material on a substrate, wherein the material is selected from the group consisting of platinum, rhodium, palladium, gold, and mixtures and alloys comprising at least one of the foregoing materials;

annealing the material; and

vaporizing a portion of the material to form a sensing element on the substrate;

vaporizing a secondary target material; and

depositing the vaporized secondary target material on the sensing element to form a protective coating.

28. The method of Claim 27, wherein the secondary target comprises about 86 wt.% alumina to about 99.5 wt.% alumina, based on a total weight of the secondary target.

29. The method of Claim 27, wherein the secondary target comprises greater than or equal to about 95 wt.% alumina, based on a total weight of the secondary target.

30. The method of Claim 27, wherein the protective coating is an aluminide or a silicide.

31. A planar temperature sensor comprising:  
a substrate;  
a sensing material disposed on the substrate, wherein the sensing material is selected from the group consisting of platinum, rhodium, palladium and mixtures and alloys comprising at least one of the foregoing sensing materials;  
a protective coating disposed on at least a portion of the sensing material, wherein the protective coating comprises an aluminide or silicide of the sensing material.
32. The planar temperature sensor of Claim 31, wherein the protective coating further comprises an additional material selected from the group consisting of yttrium, zirconium, and mixtures comprising at least one of the foregoing materials.
33. The planar temperature sensor of Claim 32, wherein the protective coating has a thickness of about 2 nm to about 20 nm.